

REMARKS

This Amendment is responsive to the December 24, 2008 Office Action. Claims 1-6 stand rejected. Claims 1 and 6 have been amended. Support for the amendment to claim 1 may be found, for example, in the specification at page 6, lines 2-8.

Rejection Under 35 U.S.C. § 112, second paragraph

Claim 6 stands rejected under 35 U.S.C. § 112, second paragraph, for indefiniteness. In particular, the term “the hollow cavity” is alleged to lack clear antecedent basis. Claim 6 has been amended to depend from claim 4 as opposed to claim 1. Reconsideration and withdrawal of this rejection are respectfully requested.

Rejection Under 35 U.S.C. § 103(a)

Claims 1-6 stand rejected under 35 U.S.C. § 103(a) for obviousness over United States Patent No. 4,509,889 to Skogberg et al. (“the ‘889 Skogberg patent”) or United States Patent No. 4,634,317 to Skogberg et al. (“the ‘317 Skogberg patent”) in view of either United States Patent No. 6,428,243 to Hutchins (“Hutchins”) or United States Patent No. 4,511,289 to Herron (“Herron”). In view of the foregoing amendment and the following comments, reconsideration of this rejection is respectfully requested.

Amended claim 1 recites, *inter alia*, “a rockbolt main body and a pressurized-fluid-introducing sleeve fixed by welding to the rockbolt main body at an end for introduction of a pressurized fluid, wherein the rockbolt main body is configured to hydraulically expand upon the introduction of the pressurized fluid, the pressurized-fluid introducing sleeve comprising a projecting part with an outer diameter larger than a diameter of an aperture of a bearing plate and a pressurized-fluid-introducing hole, and a bearing-plate-holding part with an outer diameter smaller than the diameter of the aperture of the bearing plate, whereby the bearing plate is held in contact with a step between the projecting part and the bearing-plate-holding part, the projecting part and the bearing-plate-holding part having a unitary construction...”.

The '889 Skogberg patent and the '317 Skogberg patent disclose an expandable tube-type rockbolt having an outer strengthening sleeve (19) threaded along its entire length so that a plate (41) can be clamped against the rock by means of a nut (42). Thus, the projecting height of the sleeve (19) increases by rotation of the nut (42).

Hutchins discloses a cable bolt (10) having a plurality of wires (11). The end of the cable bolt is terminated with a sleeve (17) having a threaded external surface for receiving a lock nut (18) to tension the bolt against a bearing plate (19). The bearing plate has a "trumpet" portion (20) welded to the bearing plate (19) and extending into a bore hole (21). The lock nut (18) includes a bore (24) that connects to a tube (26) for the introduction of a grout mix.

Herron discloses an expandable rockbolt having a conventional fluid-introduction sleeve (13) and is relied upon in the Office Action at page 3 to teach a fluid-introducing hole (18) on the sleeve (13) (See Figs. 1 and 2). In the device of Herron, the steel tube (11) is directly connected with the sleeve (13).

The cited references, whether considered alone or in combination, fail to teach or suggest where the projecting part and the bearing-plate-holding part have a unitary construction as recited in independent claim 1.

The outer strengthening sleeve (19) and the nut (42) of the '889 Skogberg patent and the '317 Skogberg patent are two separate elements with the nut (42) being threaded onto the sleeve (19) to clamp the plate (41) against the rock. Similarly, the lock nut (18) of Hutchins is threaded onto the sleeve (17). Because the nut (42) of the Skogberg patents and the nut (18) of Hutchins are separate elements, upon tightening of the nuts, the sleeve in the Skogberg patents and the Hutchins patent extend from the sleeves and increase the projection height of the rockbolts. In contrast, the pressurized-fluid-introducing sleeve of the present invention includes a projecting part and a bearing-plate-holding part having a unitary construction whereby the amount that the projecting part extends from the borehole is decreased and cracking of the concrete lining layer is reduced. The conventional fluid-introduction sleeve (13) of the Herron patent fails to teach or suggest a pressurized-fluid-introducing sleeve and a bearing-plate-holding part as recited in independent claim 1 and,

therefore, fails to overcome the deficiencies of the '889 Skogberg patent, the '317 Skogberg patent and the Hutchins patent.

The device according to one embodiment of the present invention maintains a firm bonding of a pressurized-fluid-introducing sleeve (10) and rockbolt main body (1) at a welded portion with a height of the sleeve projecting from a sprayed concrete layer being decreased such that a lining concrete layer is prevented from thickness deviation and cracking. In other words, because the pressurized-fluid-introducing sleeve is attached and welded to an end of a deformed steel pipe of an expansive rockbolt, mere shortening of the sleeve accelerates deformation of the pipe at positions near the welded joint during hydraulic expansion of the deformed steel pipe, resulting in the breakdown of the joint of the sleeve and the deformed steel pipe due to an excess of hydraulic pressure.

For instance, a bottom (a) of a dent is affected by a tensile stress, and a part near a welded joint (b) is often broken during expansion of a rockbolt (see Figs. 3A and 3B of the present application). In order to suppress deformation of a pipe at a position near the joint (b) during hydraulic expansion, the sleeve should have a certain length, which depends on material and weld strength of a deformed steel pipe. Merely shortening the sleeve for suppression of a projecting height is not practical in that the proper strength is not ensured. Thus, the steel pipe rockbolt according to one embodiment of the present invention has a pressurized-fluid-introducing sleeve with a large-diameter part and a small-diameter part having a unitary construction and formed in series. The small-diameter part is inserted into a bearing plate and placed in a rockbolt-setting hole of a bedrock or ground. The large-diameter part only projects outwards from a splayed concrete layer, so as to suppress a projection height (see page 4, line 17 to page 5, line 7 of the specification).

Therefore, for at least the foregoing reasons, the cited references, whether considered alone or in combination, fail to render independent claim 1 obvious. Reconsideration and withdrawal of this rejection are respectfully requested.

Claims 2-6 depend from and add further limitations to independent claim 1. Thus, claims 2-6 are deemed to be in condition for allowance for all of the reasons set forth above in connection with independent claim 1.

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Conclusion

In view of the foregoing amendments and comments, Applicants respectfully request reconsideration of the rejection of claims 1-6 and allowance of the same.

Respectfully submitted,
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